

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to ornamental sheeting

I, EUGENE AARON MAGID, a citizen of the United States of America of 1610 Cloverly Lane, Rydal, Pennsylvania, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns improvements in or relating to ornamental sheeting.

Valley printing has been proposed in which an engraved embossing roller was employed to simultaneously depress and print the normally exposed surface of a plastic sheet. This procedure was subject to many limitations, including those of limited aesthetic effect and durability.

It is an object of the present invention to provide a construction of plastic sheeting and method of manufacture wherein may be achieved the appearance of valley printing, with an additional three-dimensional or depth effect, and wherein the printed effect is immune from wear by abrasion and the like, being totally protected therefrom.

In one embodiment of the invention, embossed ornamental sheeting in which the appearance of valley printing is simulated, comprises a multi-ply web of material, at least the outer ply of which is light-permeable, said outer ply having portions of its normally exposed side depressed to emboss corresponding portions of its normally concealed side which confronts a backing ply to which it is bonded, and a decorative coating on said embossed portions, said coating being visible through the light-permeable outer ply from the exposed side thereof.

In another embodiment of the invention, ornamental plastics sheeting comprises a light permeable thermoplastic pre-printed sheet, said sheet having portions of its nor-

mally exposed side depressed in an ornamental pattern to emboss corresponding portions of its normally concealed side which bears the printing, and a decorative coating on said embossed portions, said coating being at least partially visible through the sheet from the exposed side to provide an attractive and protected valley printing effect.

A method, embodying the invention, of making multi-ply ornamental sheeting, comprises depressing portions of the normally exposed side of a light-permeable thermoplastic sheet in an ornamental pattern to emboss corresponding portions of its normally concealed side, and applying a decorative coating to the embossed portions of the normally concealed side, said coating being visible through said sheet from the normally exposed side thereof, and securing a backing layer to the normally concealed side of said sheet over said coating, to provide an attractive and protected valley printing effect.

An apparatus, when used for carrying out such method, comprises a rotary patterned embossing roller having a predetermined pattern of embossing projections distributed over its outer surface, at least two back-up rollers respectively having parallel axes which are parallel to the axis of said embossing roller, said back-up rollers being spaced around the circumference of said embossing roller and being located directly next to said embossing roller to press sheet material against said embossing roller and defining a pair of nips therewith, respectively, so that when a light permeable sheet is passed through one nip defined by one of the back-up rollers the sheet is pressed into said embossing roller between the projections thereof, portions of the normally ex-

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posed side of that sheet being depressed to emboss corresponding portions of its normally concealed side, and when simultaneously with the passage through said one nip the embossed light-permeable sheet pressed into said embossing roller is confronted with another sheet by passing said other sheet through the other nip, a laminated sheet structure issues from said other nip, and a coating station located adjacent said embossing roller between said back-up rollers and providing a decorative coating on said embossed portions of the light-permeable sheet which coating thus becomes located between said sheets in the laminated sheet structure.

In order that the invention may be well understood there will now be described some embodiments thereof, given by way of example only, with reference to the accompanying drawing, in which:

Figure 1 is a diagrammatic representation of plastic-sheet-treating apparatus illustrative of the method of the present invention;

Figure 2 is an enlarged fragmentary elevational view of the apparatus of Figure 1, partly in section for clarity;

Figure 3 is a fragmentary plan view showing sheeting construction embodying the present invention, an upper or facing layer being partially turned back to expose an under or backing layer;

Figure 4 is a partial sectional elevational view taken generally along the line 4-4 of Figure 3;

Figure 4a is a sectional view similar to Figure 4, showing a slightly modified embodiment thereof;

Figure 4b is a sectional view similar to Figures 4 and 4a, showing a further slightly modified embodiment of the present invention;

Figure 5 is a diagrammatic representation of apparatus illustrating the practice of a slightly modified method; and

Figure 6 is a fragmentary sectional view similar to Figure 4 and illustrating plastic sheeting as produced by the apparatus of Figure 5.

Referring now more particularly to the drawings, and specifically to Figures 1-4 thereof, the apparatus of Figure 1 includes a rotatable supply roll or coil 10 supplying a web of light-permeable thermoplastic sheet material 11. The sheet material 11 may be transparent, translucent, or of other desired light permeability, and may pass over heating rollers 12 and 13 in the direction of arrow 14. The sheet material 11 passes thence between the nip of tangential rollers 15 and 16, the former being a relatively hard, engraved roller, such as of steel or other suitable material, and the latter being a relatively soft impression or back-up roller, say of rubber or other suitably resili-

ently yieldable material. The rollers 15 and 16 rotate in the direction of arrows 17 and 18, respectively, the web or sheeting 11 passing between the tangential rollers and there being pressure-formed to assume the configuration of engraved roller 15, as at 20, best seen in Figure 2. For this purpose, the web or sheet 11 may advantageously be preheated, say by rollers 12 and 13, or other suitable heating means, as desired.

The formed sheet or web 20 passes thence about the engraved roller 15, some 180 degrees thereabout in the illustrated embodiment. Along this path there is provided a coating station including an inking roll 21 having associated therewith an ink fountain 22 and doctor blade 23. The inking roll is in tangential engagement with a transfer roll 24 to transfer ink to the latter, and the transfer roll 24 is in tangential engagement with the outer surface of formed web or sheet 20 on the engraved roller 15 to apply a coating of decorative material, ink, adhesive, combination thereof, or other desired material, to the embossed portions of the sheet.

As best seen in Figure 2, the heated thermoplastic web or sheet 11 is depressed into the impression roller 16 by the raised portions or lands 25 of engraved roller 15 to form in the sheet 20 depressions 26, as viewed from the radially inner side of the sheet. These depressed portions 26 are, of course, of the ornamental configuration of the engraved roller 15 and may be considered as embossing on the radially outer surface of the sheet 20. It is the embossed surface portions which are coated or imprinted by roller 24.

At the right in Figure 1 is a supply roll 30 supplying a web of backing-sheet material 31, as by rotation in the direction of arrow 32. The backing sheet or web 31 may be trained about a series of heating rollers 33, 34, 35 and 36, for movement in the direction of arrows 37, 38, 39 and 40, and thence pass over heating roller 41 into the nip between engraved roller 15 and an additional impression roller 42. The impression roller 42 may be of suitable hardness for its intended purpose, as will appear more fully hereinafter, and have associated therewith a lubricating liquid 43 and a squee-gee or liquid-removal roller 44.

The pressure-formed sheet or web 20 and backing sheet 31 are fed together into facing relation between the tangentially rotating engraving roller 15 and impression roller 42, there being laminated together and passing therefrom as a laminate web construction 45. The web 45 may pass about cooling roller 46 and idler 47, in the direction of arrow 48, and thence be wound upon a take-up roll 49 in the direction of arrow 50.

In addition, if desired, an intermediate sheet or layer 51, from a supply roll 52, may

pass together with the backing sheet or layer 31 for lamination with the sheet 20, the layer 51 being sandwiched in interposed relation between the sheets 20 and 31.

- 5 If desired, the backing sheet or layer 31 may be preprinted or decorated in any suitable manner, and may be of thermoplastic or other suitable material for securement by heat and pressure to the formed web 20; or
10 it may be of suitable material which is merely adhesively secured to the latter web. For such securement, the rolls 21 and 24 may be employed to coat the embossing of web 20 with a suitable transparent or
15 colored adhesive instead of the ink, and in both the latter cases the roller 42 would be harder than the roller 16, to serve as a back-up roller to provide any additional pressure required to bond the plies of the web together, and also to restrain the backing layer 31 from being impressed into conforming relation with the formed sheet 20.

The intermediate or filler layer 51 may be of any suitable sheet material, such as netting, fabric, foam, or lace, and may be used for strength, insulation or decoration, as desired.

Further, the impression roller 42 may be of relatively yieldable material, such as medium-durometer rubber, similar to that of impression roll 16, whereupon the backing layer 31 will be impressed into conforming relation with the formed sheet 20.

This condition is shown in Figures 3 and 4, the formed sheet 20 having thermoforced depressions 26 providing on the outer or normally exposed surface depressed portions 55 and, on the inner or normally concealed surface embossed portions 56. The embossed portions are coated with suitable decorative material, such as ink or adhesive, as at 57. The backing sheet or web 31 has been formed, at the nip of rollers 15 and 42, into conforming relation with the sheet 20, and secured thereto, as by heat and pressure, or adhesive.

In the embodiment of Figure 4a, a formed sheet 20a includes depressed formations 26a having outer depressed surface portions 55a on the outer or exposed surface of sheet 20a and embossed surface portions 56a on the inner or concealed side of sheet 20a. A coating material may be applied to the embossed portions 56a of the normally concealed surface, and a backing layer 31a secured to the normally concealed side of the sheet. The backing layer 31a may be substantially flat, or without depressions, extending between and secured to the depressions 26a and spaced from the remainder of the sheet 20a. This provides intersheet spaces 58a which may be occupied by atmospheric air to afford a quilted or cushioning effect.

The embodiment of Figure 4b is similar

to that of Figure 4a, except that an intermediate layer or sheet 51b is sandwiched between the formed sheet 20b and backing sheet 31b, the sandwich layer 51b being illustrated as of foam and expanded to fully occupy the space between the sheets 20b and 31b.

The apparatus of Figure 5 is similar to that of Figure 1. A supply roll of light-permeable thermoplastic sheet material which is pre-printed on one face, is generally designated 10c. The web 11c extends therefrom between the nip of engraved roller 15c and a relatively soft impression roller 16c. Proceeding from the nip of rollers 15c and 16c is a formed sheet or web 20c which moves on a roller 15c past a printing or coating station including a transfer roll 24c, feed roll 21c and ink-supply fountain 22c. Thus, decorative material, such as ink, is applied to the embossed or raised surfaces of web 20c, whereupon the decorated web passes by cooling drum 47c for coiling about a take-up roll 49c.

The product of Figure 5 is shown in Figure 6, the formed sheet there being designated 20c and having its normally exposed surface formed with depressed portions 26c defining on the normally concealed surface corresponding embossed surface portions 56c having a coating 57c of the coating material.

It should be understood that "sheeting" is used in its broadest sense and is intended to include any and all flexible webs of all kinds, quality and gage of material.

WHAT I CLAIM IS:—

1. Ornamental sheeting in which the appearance of valley printing is simulated, comprising a multi-ply web of material, at least the outer ply of which is light-permeable, said outer ply having portions of its normally exposed side depressed to emboss corresponding portions of its normally concealed side which confronts a backing ply to which it is bonded, and a decorative coating on said embossed portions, said coating being visible through the light-permeable outer ply from the exposed side thereof.
2. Ornamental sheeting according to claim 1, wherein at least the light-permeable outer ply is of plastics material.
3. Ornamental sheeting according to claim 1, wherein each of the plies is of plastics material.
4. Ornamental plastics sheeting according to any of claims 1 to 3, said backing ply being secured to only the embossed portions of said normally concealed side.
5. Ornamental sheeting according to claim 4, in combination with cushioning material interposed between said light-permeable outer ply and said backing ply.
6. Ornamental sheeting according to

claim 5, said cushioning material comprising entrapped air.

7. Ornamental plastics sheeting according to claim 5, said cushioning material comprising plastics foam.

8. A method of making multi-ply ornamental sheeting, comprising depressing portions of the normally exposed side of a light-permeable thermoplastic sheet in an ornamental pattern to emboss corresponding portions of its normally concealed side, and applying a decorative coating to the embossed portions of the normally concealed side, said coating being visible through said sheet from the normally exposed side thereof, and securing a backing layer to the normally concealed side of said sheet over said coating, to provide an attractive and protected valley printing effect.

9. A method according to claim 8, further characterized in applying said coating by a roller.

10. A method according to claim 8 or claim 9, wherein said backing layer is secured by passing both the sheet and the layer simultaneously between the nip of an embossing roller and an impression roller.

11. A method according to any of claims 8 to 10, wherein said backing layer is secured to the normally concealed side of said sheet over said coating in conforming relation with said sheet.

12. A method according to any of claims 8 to 10, further characterized in securing said backing layer to only said coated portions of said sheet and in spaced relation with the remaining portions of said sheet.

13. A method according to claim 12, further characterized by securing a cushioning material in the space between said backing layer and said remaining portions of said sheet.

14. A method according to claim 12, further characterized by securing an intermediate layer between said sheet and backing layer.

15. A method according to claim 8, further characterized in depressing said sheet while heated by rolling action between a relatively hard embossing roller and a relatively soft impression roller.

16. A method according to claim 15, further characterized in securing said backing layer to the normally concealed side of said sheet over said coating by the rolling action of said sheet and said backing layer between said embossing roller and a second impression roller.

17. A method according to claim 16, said second impression roller being soft for securing said backing layer in conforming relation with said sheet.

18. A method according to claim 16, said second impression roller being relatively

hard for securing said backing layer to only the coated portions of said sheet.

19. Ornamental plastics sheeting comprising a light-permeable thermoplastic pre-printed sheet, said sheet having portions of its normally exposed side depressed in an ornamental pattern to emboss corresponding portions of its normally concealed side which bears the printing, and a decorative coating on said embossed portions, said coating being at least partially visible through the sheet from the exposed side to provide an attractive and protected valley printing effect.

20. Ornamental plastics sheeting according to claim 19, in combination with a backing layer secured to the normally concealed side of said sheet.

21. Ornamental plastics sheeting according to claim 20, said backing layer being secured in conforming relation with the concealed side of said sheet.

22. Ornamental plastics sheeting substantially as herein described with reference to Figures 3, 4, 4a, 4b, or 6 of the accompanying drawing.

23. A method of making sheeting substantially as herein described with reference to Figures 1, 2 or 5 of the accompanying drawing.

24. An apparatus, when used for carrying out the method according to claim 8, comprising a rotary patterned embossing roller having a predetermined pattern of embossing projections distributed over its outer surface, at least two back-up rollers respectively having parallel axes which are parallel to the axis of said embossing roller, said back-up rollers being spaced around the circumference of said embossing roller and being located directly next to said embossing roller to press sheet material against said embossing roller and defining a pair of nips therewith, respectively, so that when a light-permeable sheet is passed through one nip defined by one of the back-up rollers the sheet is pressed into said embossing roller between the projections thereof, portions of the normally exposed side of that sheet being depressed to emboss corresponding portions of its normally concealed side, and when simultaneously with the passage through said one nip the embossed light-permeable sheet pressed into said embossing roller is confronted with another sheet by passing said other sheet through the other nip, a laminated sheet structure issues from said other nip, and a coating station located adjacent said embossing roller between said back-up rollers and providing a decorative coating on said embossed portions of the light-permeable sheet which coating thus becomes located between said sheets in the laminated sheet structure.

25. An apparatus according to claim 24,

including sheet-delivering means coacting with said other nip for receiving the laminated sheet structure therefrom and delivering the laminated sheet structure to a desired location.

26. An apparatus according to claim 25, wherein a third sheet-feeding means coacts with said other nip for feeding a third sheet thereto between said light-permeable sheet and said other sheet, so that said third sheet is sandwiched at said other nip between said light-permeable sheet and said other sheet to form therewith a laminated sheet structure delivered from said other nip by said sheet-delivering means.

27. An apparatus according to claim 24 or claim 25, wherein said one back-up roller is a resiliently yieldable roller coacting with said embossing roller to emboss the light-permeable sheet as it passes through the nip between said one back-up roller and said embossing roller.

28. An apparatus according to claim 27, wherein said other back-up roller is a resiliently yieldable impression roller coacting with said embossing roller for conforming said other sheet to said embossed light permeable sheet.

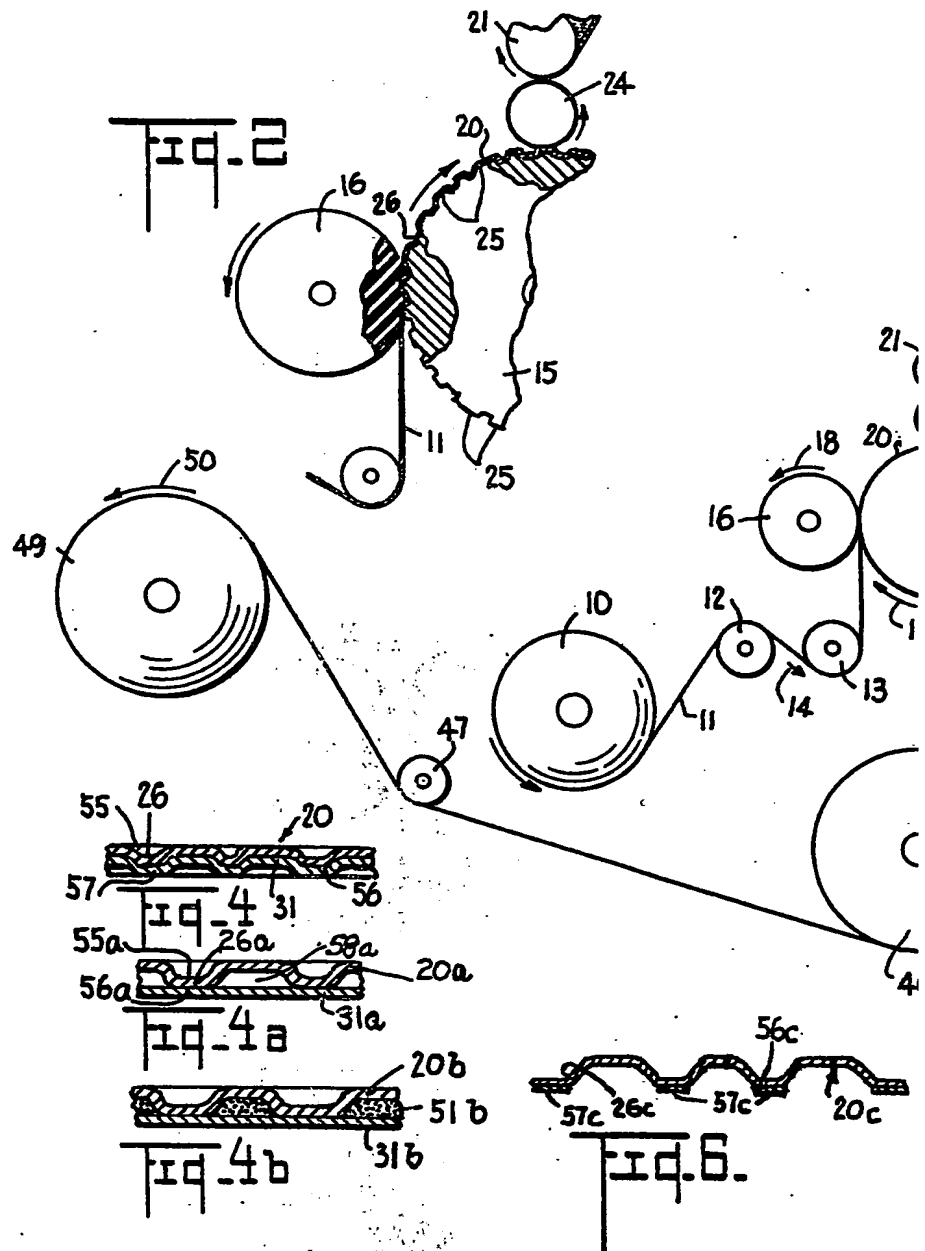
29. An apparatus according to claim 27, wherein the other of said back-up rollers is a relatively hard, substantially non-yieldable

back-up roller for laminating the other of said sheets to the embossed portions formed on said light-permeable sheet during passage thereof between said embossing roller and said one back-up roller, whereby the spaces between said embossed portions of said light-permeable sheet will be closed by said other sheet so that the laminated sheet structure forms a quilted construction having air-filled chambers defined between the sheets.

30. An apparatus according to claim 26, wherein the other of said back-up rollers is a relatively hard, substantially non-yieldable back-up roller for laminating the other of said sheets to the embossed portions formed on said light-permeable sheet, and said third sheet-feeding means feeding a third, foam-plastic sheet between said light-permeable sheet and said other sheet, so that said third sheet fills spaces between the embossed portions of said light-permeable sheet and the other sheet.

31. An apparatus according to claim 24 and substantially as herein described with reference to Figures 1 and 2, or Figure 5, of the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

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Fig. 1

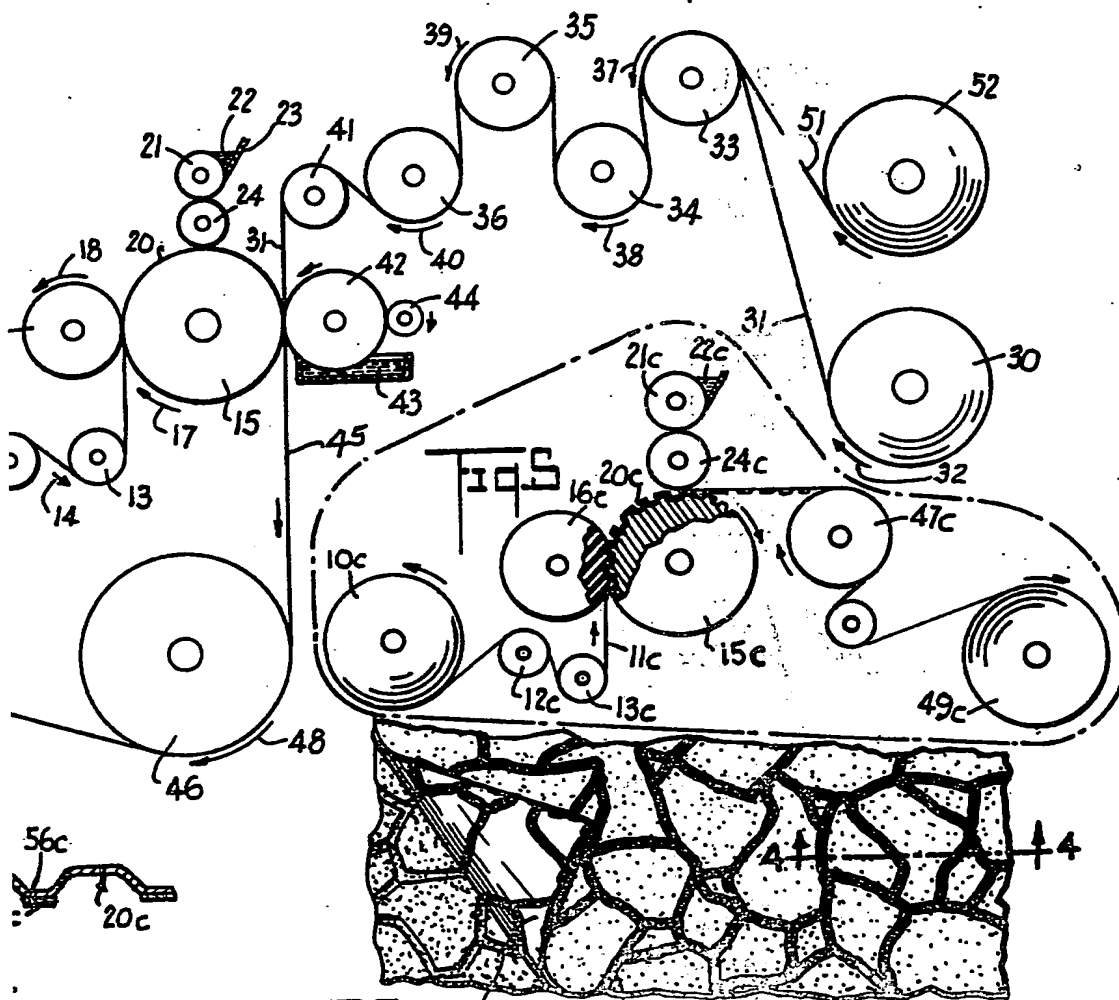
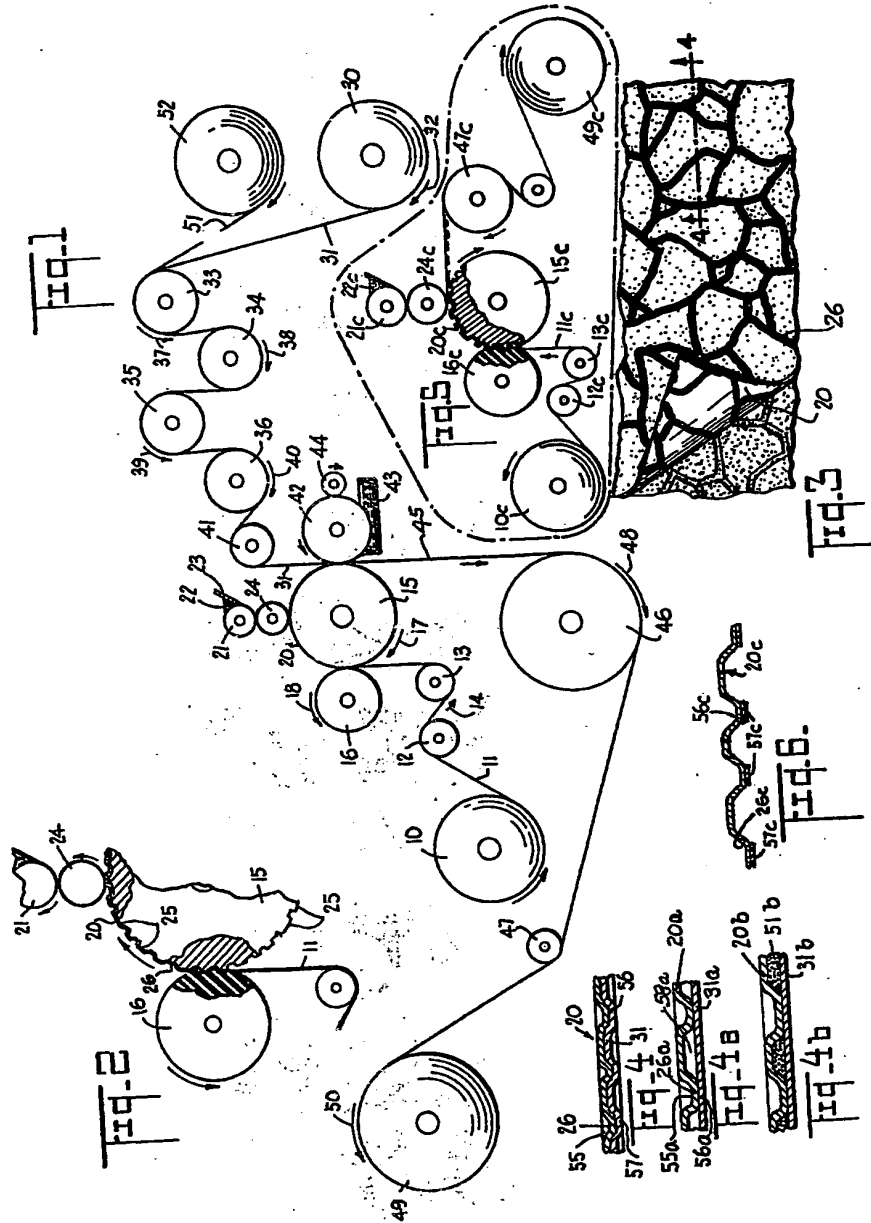


Fig. 3

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